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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/700,136	11/03/2003	Tomio Matsuzaki	03663/LH	3722
1933	7590	12/28/2005	EXAMINER	
FRISHAUF, HOLTZ, GOODMAN & CHICK, PC			LOKE, STEVEN HO YIN	
220 Fifth Avenue			ART UNIT	
16TH Floor			PAPER NUMBER	
NEW YORK, NY 10001-7708			2811	

DATE MAILED: 12/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/700,136	<b>Applicant(s)</b> MATSUZAKI ET AL.	
	<b>Examiner</b> Steven Loke	<b>Art Unit</b> 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 14 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,3-16,36 and 37 is/are pending in the application.
- 4a) Of the above claim(s) 5-11 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 36 is/are allowed.
- 6) ☒ Claim(s) 1,4,12-16 and 37 is/are rejected.
- 7) ☒ Claim(s) 3 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>8/19/05</u> . | 6) <input type="checkbox"/> Other: _____  |

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1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 4, 13 and 37 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Sakamoto et al.

In regards to claim 1, Sakamoto et al. show all the elements of the claimed invention in figs. 10A and 10B. It is a semiconductor device, comprising: a semiconductor substrate [12] having a plurality of connecting pads (a lower portion of layer SD) on one surface; an insulating film (the lower portion of the under-fill material AF and a lower portion of layer [14]) (paragraphs [0052] and [0053]) which is formed of a single layer and covers said one surface of the semiconductor substrate, and which includes: (i) a plurality of holes (the area where the upper portion of layer SD is formed) extending through the insulating film, each of the holes corresponding to one of the connecting pads, and (ii) at least one recess (the area adjacent the lower portion of layer [14]) extending partially through the insulating film such that a bottom surface of the recess is depressed with respect to an upper surface of the insulating film (the top surface of the lower portion of layer [14]) in a direction of thickness of the insulating film; each said recess extending from a first position at an edge of one of said holes to a second position outside an area above the connecting pad to which said one of the holes corresponds; and at least one interconnection (the lower portion of layer [23]) formed on the bottom surface of a corresponding said at least one recess to extend along the

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bottom surface, each said at least one interconnection being connected to a corresponding one of the connecting pads through a corresponding one of the holes in the insulating film.

In regards to claim 4, Sakamoto et al. further disclose the at least one interconnection comprises a connecting pad portion, and wherein the semiconductor device further comprises: a bump electrode (an upper portion of layer [23]) formed on the connecting pad portion, and an encapsulating film (an upper portion of the under-fill material AF and an upper portion of layer [14]) formed around the bump electrode and on the insulating film and the at least one interconnection.

In regards to claim 13, Sakamoto et al. further disclose the recess in the insulating film has a depth which is not less than a thickness of the interconnection.

In regards to claim 37, Sakamoto et al. show all the elements of the claimed invention in figs. 10A and 10B. It is a semiconductor device, comprising: a semiconductor substrate [12] having a plurality of connecting pads (the lower portions of layers SD) on one surface; a protective film (the under-fill material AF and the layer [14]) (paragraphs [0052] and [0053]) formed of a single layer, said protective film including: (1) a plurality of holes extending completely through the protective film, each of the holes corresponding to one of the connecting pads, and (ii) a plurality of recesses (the area adjacent the layer [14]) extending partially through the protective film, each of said recesses having a recessed surface that is lower than an upper surface of the protective film in a thickness direction of the protective film, and each of said recesses extending from a first position at an edge of one of said holes to a second position outside an area

above the connecting pad to which said one of the holes corresponds; and interconnections [23] which are respectively connected to the connecting pads through the holes in the protective film, and which are provided on the recessed surfaces of the protective film to extend along the recessed surfaces.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 12 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakamoto et al.

In regards to claim 12, Sakamoto et al. differ from the claimed invention by not showing the insulating film is made of an organic resin.

It would have been obvious for the insulating film is made of an organic resin because it is a widely used material to protect the chip from the external environment.

In regards to claim 14, Sakamoto et al. differ from the claimed invention by not showing the insulating film has a thickness of 10 to 30  $\mu\text{m}$ .

It would have been obvious to one having ordinary skill in the art at the time the invention was made for the insulating film has a thickness of 10 to 30  $\mu\text{m}$ , since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

In regards to claim 15, Sakamoto et al. differ from the claimed invention by not showing the recess has a depth of 5 to 15  $\mu\text{m}$ .

It would have been obvious to one having ordinary skill in the art at the time the invention was made for the recess has a depth of 5 to 15  $\mu\text{m}$ , since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

In regards to claim 16, Sakamoto et al. differ from the claimed invention by not showing a distance between a bottom surface of the insulating film and the bottom surface of the recess is not less than 1  $\mu\text{m}$ .

It would have been obvious to one having ordinary skill in the art at the time the invention was made for a distance between a bottom surface of the insulating film and the bottom surface of the recess is not less than 1  $\mu\text{m}$ , since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

5. Applicant's arguments filed 10/14/05 have been fully considered but they are not persuasive.

It is urged, in page 11 of the remarks, that the electrical connection means 23 are clearly not formed on any surface of a recess extending partially through under-fill material AF and isolation trench 14. However, the electrical connection means 23 are clearly formed on a bottom surface of a recess through the layer [11D] extending

partially through under-fill material AF and isolation trench 14. The electrical connection means [23] are also connected to the connection pads SD through the layer [11D].

It is urged, in page 12 of the remarks, that Sakamoto et al. does not disclose a recess that extends from a first position at an edge of one of the holes to a second position outside an area above the connecting pad to which the one of the holes corresponds. However, Sakamoto et al. does disclose a recess that extends from a first position at an edge of one of the holes (the holes adjacent to SD) to a second position outside an area above the connecting pad SD to which the one of the holes corresponds.

It is urged, in page 12 of the remarks, that Sakamoto et al. never teaches or suggests at least one recess extending partially through the insulating film such that a bottom surface of the recess is depressed with respect to an upper surface of the insulating film in a direction of thickness of the insulating film. However, Sakamoto et al. teach at least one recess extending partially through the insulating film (AF and [14]) such that a bottom surface of the recess is depressed with respect to an upper surface of the insulating film in a direction of thickness of the insulating film.

6. Claim 36 is allowed.

7. Claim 3 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Loke whose telephone number is (571) 272-1657. The examiner can normally be reached on 8:00 am to 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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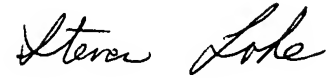
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December 25, 2005

Steven Loke  
Primary Examiner

A handwritten signature in cursive script that reads "Steven Loke".